CHEMICAL SEALANTS FOR THE CONTROL OF WIND-BLOWN COAL DUST FROM UNIT COAL TRAINS

- A LISTING OF PRODUCTS AND SPECIFICATIONS

Prepared by

D. Cope - Transportation Systems Division, EPS
E. Wituschek - Pacific and Yukon Region, EPS
Dr. D. Poon - Pacific and Yukon Region, EPS
Environment Canada

This manuscript report has not undergone a detailed technical review by the Environmental Protection Service in order to hasten the transfer of information to those people working in related studies. Mention of trade names or commercial products in this report does not constitute endorsement by Environment Canada.

Comments concerning the content of this report should be directed to:

Transportation Systems Division
Industrial Programs Branch
Environmental Protection Programs Directorate
Environmental Protection Service
Environment Canada
Ottawa, Ontario
K1A 1C8

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SUMMARY

The spraying of chemical sealants over the surface of loaded coal is the dust control method adopted by all of the large coal mining companies in western Canada that ship coal by unit train over long distance. In order to aid users, control agencies and others investigating methods for improving the performance of chemical sealant spray dust control systems this document lists commercially available products which have been used as, tested as, or marketed as coal dust suppressants.

Detailed specifications for products have been presented in this report to the extent that information was available.

WARNING: Product information is subject to update by the manufacturer, therefore the product specifications contained in this report may have changed since the date of publication.

Mention of trade names or commercial products in this report does not constitute endorsement by Environment Canada.

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1 INTRODUCTION

Wind-blown coal dust from the transportation of coal by unit train in western Canada has been recognized as a nuisance air pollution problem since the early 1970's and coating loaded coal by spraying a chemical sealant over the surface has been the dust control method adopted by all of the large coal mining companies in western Canada that ship coal by unit train over long distance.

In 1975, after the in-situ testing of several chemical sealants, investigators optimistically predicted that chemical sealant spray control systems would be able to achieve surface sealing crust-retention averages (on cars arriving at the end terminals) of close to 100% by the end of the 1970's thereby effectively eliminating fugitive dust emissions (Ref. 1). However, the crust-retention averages on two groups of coal trains in 1981 and 1982 were less than 85%, (Refs. 2 and 3), and although improvements in dust control have been noted since the early 1970's, incidents of severe nuisance dusting continue to occur (Ref. 4). Wind-blown coal dust from unit coal trains is still a problem for citizens living along many of the coal-rail corridors in western Canada and research into improving the performance and hence the dust abatement capability of the chemical spray technique is continuing.

Several authors have reported on the history of the coal dusting problem along with reasons for chemical spray system performance failures and suggestions for improving this dust control technique (Refs. 1 to 12). One suggestion frequently mentioned as a possible means of improving control system performance is to employ new or improved sealant chemicals. Prior to the 1983 operating year latex-based chemicals predominated in western Canada, but because of performance inconsistencies several coal mining companies switched to or began experimenting with new sealant chemicals or new spray formulations in an attempt to find coal surface coatings capable of withstanding the rigors of unit train coal shipment.

In order to aid these investigations this report lists the sealant chemicals which are marketed as (or were once marketed as) coal dust suppressants for unit trains. In addition to the product list, where available, the detailed specifications for many of the chemicals listed have been included in Appendix A.

2 CHEMICAL SEALANTS

Products proposed for use as surface sealants for coal cars may be judged from two aspects, their properties with respect to handling and application and the performance of their crust or dust abating surface coatings. The most desirable properties for chemical sealants are listed under these headings in Table I and discussed in Sections 2.1 and 2.2. For additional information on the properties of dust suppressants the reader is advised to consult References 1, 6, 7 and 10. For information with respect to the wind entrainment of fine particles, Reference 8 is suggested.

2.1 Handling and Application

a) Readily Available From the Supplier:
A distribution network in western Canada is required.

b) Long Shelf Life:
Since most users buy their chemicals in bulk, the commercial strength chemical purchased from the supplier must be capable of being stored for several months before use without changes in the chemical or physical properties.

c) Adequate Freeze-Thaw Cycling, +35°C to -35°C:
Again because of the long storage requirement, the commercial strength chemical, and to some extent the diluted coal car spray produced from it, must be able to withstand exposure to a wide temperature range and a number of temperature cycles without changes in the chemical or physical properties.

d) Stable in the Mixed State:
Most commercial strength sealant chemicals are diluted in advance of application and the final batch is not sprayed for up to eight hours after mixing. Therefore, the mixed solution or emulsion must not separate or alter its physical or chemical properties before use.

e) Ease of Mixing and Application (Compatible):
All of the major coal companies shipping coal over long distances in western Canada have chemical storage, mixing and application equipment in place at their coal loadouts. It is highly desirable that any new chemical or new chemical formulation be readily compatible with the existing equipment.

f) Workable at Extreme Temperatures:
Coal mining companies load trains during the hottest and coldest months therefore the sealant chemicals must be capable of being handled and applied at extreme

TABLE I CHEMICAL SEALANTS - DESIRABLE PROPERTIES

1. HANDLING AND APPLICATION

a) Readily Available from the Supplier.
b) Long Shelf Life.
c) Adequate Freeze-Thaw Cycling: +35°C to -35°C.
d) Stable in the Mixed State.
e) Ease of Mixing and Application (Compatible).
f) Workable at Extreme Temperatures.
g) Environmentally Acceptable.
h) Biodegradable.
i) Nonflammable.
j) Rapid Cure Time.
k) Low Cost.
l) Effectiveness in Low Concentrations.

2. PERFORMANCE OF THE SURFACE COATING

a) Wind and Fracture Resistant Crust or Surface Coating.
b) Able to Adhere to Sloped or Irregular Surfaces.
c) Able to Resist to Extreme Environmental Changes - Temperature, Humidity and Precipitation.
d) Environmentally Acceptable with Respect to Runoff.
e) Must be Compatible with the Final Use of the Coal.

NOTE: Many of these items are listed in Reference 7.

temperatures. It is important that the dilute spray be able to seal the coal surface of a loaded car regardless of the temperature of the air or the coal (+35°C to -35°C).

g) Environmentally Acceptable:

Most sealant chemical spray facilities operate in an open air, non-recirculating mode consequently wind dispersion, runoff or spills may result in the fugitive release of sealant chemicals to the environment. The fugitive release of these sealant chemicals must not present a hazard to health nor to the environment in general.

h) Biodegradable:

To prevent the undesirable buildup of spilled or leaked chemicals biodegradable products are preferred.

i) Nonflammable:

The product should not present a fire hazard.

j) Rapid Cure Time:

For chemicals which rely on crust formation for effectiveness, the crust or surface layer must set or cure within a few minutes of application.

k) Low Cost and

l) Effectiveness in Low Concentrations:

These two factors are interrelated since the application cost is dependent upon the quantity of commercial strength chemical sprayed on each coal car. Therefore sealant chemicals which provide effective dust suppression at low concentration will be the most economical.

2.2 Performance of the Surface Coating.

a) Wind and Fracture Resistant Crust or Surface Coating:

During a long journey the coal loaded in a rail car is subjected to continuous vibration while moving, plus intermittent high amplitude shock and turbulent winds over the surface. The surface of a coal car will be subject to these physical forces and the sprayed chemical sealants should produce a stable crust or surface coating which has the physical and chemical properties necessary to withstand these destructive factors.

Crusts formed by sealant chemicals should have the elastic strength to retain their integrity over an entire coal car surface and to resist wind lift during transit. Agglomerating or non-crusting chemicals must penetrate to a sufficient depth to

form a surface over the coal load which retains its agglomerating properties and the integrity of its seal throughout an entire rail journey.

b) Able to Adhere to Sloped or Irregular Surfaces:

Steep slopes at the ends of loaded coal cars along with distorted or irregular surface profiles have been identified in the laboratory and in the field as the areas most prone to crust breakup over long transportation distances. Surface coatings with regenerative properties have demonstrated an ability to better withstand surface breakups. This regenerative property, most evident with oil emulsions, has been shown to provide additional protection to sloped surfaces (Ref. 1).

Fine coal particles exposed through fractures and breakup of the surface coating can become entrained in over-surface winds and emitted as fugitive coal dust. New chemicals or spray formulations should have a demonstrated ability to provide and maintain a dust abatement seal over sloped or irregular surfaces.

c) Able to Resist Extreme Environmental Changes - Temperature, Humidity and Precipitation:

The crust or surface coating provided by sealant chemicals must remain intact and retain the integrity of its seal over an entire coal car surface regardless of extreme changes in humidity, temperature and precipitation experienced en route.

d) Environmentally Acceptable with Respect to Runoff:

Any runoff of fluids from coal cars en route associated with the sealant chemicals or with the surface coating formed by the chemicals must not present a hazard to health nor to the environment in general.

e) Must be Compatible with the Final Use of the Coal:

The physical and chemical properties of the coal required by the end user must not be adversely affected by the sealant chemicals added at the mine site and the sealant chemicals added to the coal must not adversely affect the environmental acceptability of the coal either when in storage or when used.

NOTE: Coal readily adsorbs oil (lipophilic property) but repels water (hydrophobic property), therefore to achieve penetration of the surface crust or coating non-oil based sealant/water emulsions usually require a wetting agent. Wetting agents also act as extenders for a binder and most manufacturers add the required agents to their proprietary commercial formulations.

3 CHEMICAL SEALANTS - A LISTING

A list of commercial dust suppressant products is presented in Table II. It is important to note that no attempt has been made to rank the products listed. Table II lists most of the more prominent chemicals which are marketed as (or were once marketed as) coal dust suppressants for unit coal trains.

The detailed specifications, where available, for the products listed in Part A of Table II have been reproduced in Appendix A. The specifications were obtained either directly from the manufacturers or suppliers in response to a request from Environment Canada or were extracted from published specification sheets. No proprietary information has been listed.

As noted earlier the sealant spray method of dust control has been in use in western Canada since the early 1970's, many of the dust suppressant products listed in Part B of Table II were used or tested during the last decade but are either no longer actively marketed for use on coal trains or have been replaced by improved formulations. Specifications have not been provided for the chemicals listed in Part B, but for each of these chemicals a reference publication has been indicated. The references contain either the results of previous tests or a report of operational experience with the chemical.

TABLE II CHEMICAL SEALANTS AND BINDING AGENTS FOR COAL DUST SUPPRESSION
(unranked listing)

No.	Brand Name	Main Base Constituent	Manufacturer or Distributor	Reference Number
Part A - Specifications Listed in Appendix A.				
1.	Coherex	Asphalt	Witco Chemical Canada Ltd.	3,9
2.	GCP Dust Suppressant 200	?	Betz Laboratories Inc.	-
3.	Coal Cover	Coal/Wax/Plastic	Atlantic Research Corp.	-
4.	Darex 3333	Latex	W.R. Grace & Co.	-
5.	EX 11-7	Sulphite Liquor	Diachem Industries Ltd.	-
6.	Bond-All NJ	Petroleum Resins	Norjohn Contracting Ltd.	3
7.	Calcium Chloride	Calcium Chloride	Allied Chemicals Ltd.	-
8.	IPG-60	Gelatine	Davis Gelatine (Canada) Ltd.	-
9.	M-167.2	Latex	Dowell of Canada	-
10.	M-166	Latex	Dowell of Canada	-
11.	Vultex 2-V-5522-B	Latex	General Latex and Chemicals	-
12.	ICA-16 TRET-O-LITE	Acrylic Copolymer	Petrolite Corp. of Canada	-
13.	Coal Pile Retainer	Resins	West Chemical Products of Canada Ltd.	-
14.	Nalco 8820	Latex	Alchem Inc.	-
15.	AMS 2000	Acrylic Polymer	Arco Chemical Company	-
16.	Pentron DC-8	Acrylic Polymer	Apollo Technologies	-
17.	Gamresin WP24	Resin	Gamlen Chemical Co.	9

TABLE II CHEMICAL SEALANTS AND BINDING AGENTS FOR COAL DUST SUPPRESSION (unranked listing) (Cont'd)

No.	Brand Name	Main Base Constituent	Manufacturer or Distributor	Reference Number
18.	Colas Crusting Agent	Asphalt	Flintkote	-
19.	MICROFOAM	Surfactant	Deter Company Inc.	-
20.	Compound SP	Latex	Johnson March	-
21.	Starch Spray	Starch	Industrial Grain Products	-
22.	M-218	Polymer in Oil	Dowell of Canada	-
23.	AMS 2010	Asphalt	Arco Chemical Company	-
24.	Hercobind DS-3	Emulsified Resin	Hercules Inc.	-
25.	Bindtex	Polymer	Rogers Bros. Ltd.	-
26.	Dust Ban 8A08	Polyacrylamide	Alchem Inc.	-
27.	Van Kap 1000 (AMS 2200)	Petroleum Emulsion	Van Waters and Rogers Ltd.	-
28.	MWR 078 & 082	?	Mine Waste Reclamation Ltd.	-
29.	Hynate S-1	Surfactant	Mitsui Co.	-

TABLE II CHEMICAL SEALANTS AND BINDING AGENTS FOR COAL DUST SUPPRESSION (unranked listing) (Cont'd)

No.	Brand Name	Main Base Constituent	Manufacturer or Distributor	Reference Number
Part B - No Specifications Listed				
30.	Reclamation Oil	Oil	Cominco	1,9
31.	Dust Suppressant 100	Asphalt	Pounder Emulsions Ltd.	1
32.	Dust Suppressant 200	Asphalt	Pounder Emulsions Ltd.	1
33.	Dowell M167	Latex	Dowell of Canada	1,8,5,6,9
34.	Alchem 63026	Latex	Alchem Ltd.	1
35.	Acquatain	?	Whitlock Construction	1
36.	Lignin Derivatives	Pulp Mill Waste	Cominco	1
37.	Coal Spray 100	Oil	Imperial Oil	1
38.	Triton CF-10	?	Rohm & Haas Company 1976	9
39.	Lignosulfonic Acid	Lignosulfonic Acid		8
40.	Flintkote SS-1	Asphalt	Flint Kote	9
41.	Heavy Residual Oil	Oil		8,6,9
42.	Alchem-Nalco 5WM-493	Latex	Alchem Ltd.	9
43.	Bitumen	Bitumen	Cominco	9
44.	Water	Water		5,9
45.	Curasol AC/	Copolymeric Plastic	Mackenzie & Feimann Ltd.	10

TABLE II CHEMICAL SEALANTS AND BINDING AGENTS FOR COAL DUST SUPPRESSION (unranked listing) (Cont'd)

No.	Brand Name	Main Base Constituent	Manufacturer or Distributor	Reference Number
46.	Dowell M145	Latex	Dowell of Canada	10
47.	Cyanaspray	Latex	Cyanamid of Canada Ltd.	10
48.	Geo Cote 8-4	?	Trans Can Grouters Ltd	10
49.	Van Kap 300	?	Van Waters and Rogers Ltd.	10
50.	DLR-H,S	Acrylic	Rohm & Haas Ltd.	6
51.	Hot Melt	Slack Wax		6
52.	Daratak SP-1065	Polyvinyl Acetate	W.R. Grace & Co.	6
53.	Everflex GT	Copolymer	W.R. Grace & Co.	6
54.	Esco M105	?	ESCO	6
55.	Wax 778	Slack Wax	Imperial Oil	10
56.	Wax Emulsion	Slack Wax	Imperial Oil	10
57.	Oil QE2296A	Oil	Imperial Oil	10
58.	Oil QE2298A	Oil	Imperial Oil	10
59.	Wax-Oil-Water	Wax	Airth Group	12

4 REFERENCES

1. "In-Transit Control of Coal Dust from Unit Trains", Fisheries and Environment Canada, Report EPS-4-PR-77-1, May 1977.

2. "Report of a Field Study - Coal Train Sealant Spray Performance Evaluation - August, 1981", EPS, Pacific Region, Environment Canada, Holmes, J.D., Cope, D.L., Margitay, J., Wituschek, E., January 1982.

3. "Performance Evaluation of Chemical Sealants and Crust Retention on Loaded Coal Trains", IEC Beak Consultants Ltd., and C.G. Environmental Ltd., for Environment Canada, June, 1983.

4. "Report on the Emission and Control of Fugitive Coal Dust from Unit Coal Trains in Canada", Cope, D., Wituschek, E., Poon, D., Environmental Protection Service Working Paper, Draft, April 1984.

5. "Minimizing In-Transit Windage Losses of Olga Low Volatile Coal", Denton, G.H., Hassel, R.E., Scott, B.E., Dowell, 10 May 1982.

6. "Development of Coatings for Protection of Coal During Transport and Storage", Kromrey, R.V., et al., U.S. Dept. of Energy, November 1978.

7. "Control of Coal Dust Pollution During Railroad Transportation - A State-of-the-Art - Review", Hardy Associates (1978) Ltd., August 1979.

8. "Wind Entrainment of Coal Particles and Its Control", Brown, R.A.S., Speichert, A., Alberta Research Council, 1979.

9. "Coal Dust Management at Nanticoke TGS", Ontario Hydro, Central Thermal Services, Booth, M.R., Whitman, W.H., Krishnamurthy, N., TG-07112, 26 September 1976.

10. "A Progress Report on a Preliminary Study of the Use of Certain Additives to Suppress Airborne Coal Dust", Lloyd, T.A., Ficko, L.A., Department of Energy, Mines and Resources, May 1971.

11. "The Testing of Coal Rail Cars Sealant Sprays and Loading Techniques Designed for the Abatement of Fugitive Coal Dust (A Laboratory Evaluation)", Prepared by Environment Canada by Morrison, Hershfield, Theakston & Rowan Ltd., September, 1982.

12. "Report on the Application and Performance of the Sealant Solutions Sprayed on Loaded Railway Cars on March 24th and 25th, 1980", Hardy Associates (1978) Ltd., for Environment Canada, April 1980.

APPENDIX A

CHEMICAL SEALANTS AND BINDING AGENTS FOR COAL DUST SUPPRESSION

DETAILED SPECIFICATIONS

ITEM NO.	PRODUCTS (UNRANKED)	PAGE NO.
1.	Coherex	15
2.	GCP Dust Suppressant 200	17
3.	Coal Cover	19
4.	Darex 3333	22
5.	EX 11-7	25
6.	Bond-All NJ	27
7.	Calcium Chloride	30
8.	IPG - 60	33
9.	M-167.2	35
10.	M-166	35
11.	Vultex 2-V-5522-B	38
12.	ICA-16 Tret-O-Lite	41
13.	Coal Pile Retainer	43
14.	Nalco 8820	45
15.	AMS 2000	47
16.	Pentron DC-8	49
17.	Gamresin WP24	51
18.	Colas Crusting Agent	53
19.	MICROFOAM	55
20.	Compound SP	57
21.	Starch Spray	59
22.	M-218	61
23.	AMS 2010	64
24.	Hercobind DS-3	66
25.	Bindtex	68
26.	Dust Ban 8A08	71
27.	VanKap 1000 (AMS 2200)	74
28.	MWR 078 and 082	77
29.	Hynate S-1	79

NOTE: Product information may have been updated subsequent to the printing of this report, readers are advised to contact manufacturers or suppliers for the latest information with respect to each of the products listed.

1. COHEREX 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: COHEREX.

COMPANY NAME - MANUFACTURER: Witco Corp. IN CANADA: NO
DISTRIBUTOR: Witco Corp. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada:

WITHIN ONE (1) WEEK

MAIN INGREDIENT: Asphalt.

CHEMICAL INGREDIENTS:

60% petroleum resins - thermo-plastic resinous petroleum
40% wetting solution.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY -: IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: Yes
ON COAL TRAINS: Yes OTHER: construction areas, ball parks etc.

Used for several months as a coal car spray at one western Canada mine beginning January, 1983.

COAL TRAIN TESTS - where- Sparwood, British Columbia
when- July 13 - 16, 1982; October, 1982
results- Satisfactory, assessment by coal company. Positive results warrant further tests - Ref. 3.

FIRE HAZARD - neither flammable nor combustible. flash point: >400°F

TOXICITY - oral toxicity: LD_{50} - 16 g/kg of body weight
- eye irritation: non-irritant
- skin irritation: non-irritant
- Accute inhalation toxicity: Negative in short term tests on albino rats.
- other: Biochemical Oxygen Demand - 95 ppm

PHYSICAL PROPERTIES - density: S.G. @ 60/60°F = 1.20 $\pm$ 0.02
- biodegradable: yes
- pour point: approximately 0°C
- viscosity: >6000 seconds SUS @ 100°F
- colour: light yellow emulsion.
- odour: slight petroleum odour

1. COHEREX 2 of 2 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Adds slightly to heat value of coal.

COAL CAR PROFILE REQUIREMENTS:

Best on flat surfaces.

STORAGE REQUIREMENTS

Store above 0°C. Concentrate shelf life is variable. Mixed solution shelf life is limited.

APPLICATION REQUIREMENTS:

Ensure solutions are well mixed; no heating required; one spray bar.

SPRAY SYSTEM - can be used in present sealant spray system: yes

No additional equipment required.

FREEZE/THAW PROPERTIES
- suitable for use at temperatures from -35°C to+35°C
- freeze/thaw recovery up to 3 cycles.

CURE TIME - (for the spray solution to provide a seal on the surface of the coal):

Less than 2 minutes. Particles are agglomerated.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	12.7	litres
	- DILUTE SOLUTION:	63.6	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	63.6	litres

2. GCP DUST SUPPRESSANT 200 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: GCP DUST SUPPRESSANT 200.

COMPANY NAME - MANUFACTURER: Betz Laboratories IN CANADA: NO
DISTRIBUTOR: ? IN CANADA: ?

AVAILABILITY IN CANADA - in Western Canada: NO
- time to deliver to Western Canada: ?

MAIN INGREDIENT: ?

CHEMICAL INGREDIENTS: ?

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: ?
ON LOADED COAL TRAINS: Proposed

Suggested for coal trains. Marketed as a dust suppressant, but exact applications not listed.

COAL TRAIN TESTS - ?

FIRE HAZARD - flammability: ?

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?

PHYSICAL PROPERTIES
- density:
- biodegradable: ?
- pour point:
- viscosity:
- odour:

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

2. GCP DUST SUPPRESSANT 200 2 of 2 pages

REACTIVITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:

CURE TIME - (for the spray solution to provide a seal on the surface of the coal):

Acts as an Agglomerating Agent, no crust is formed.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR - CONCENTRATE: ?
- DILUTE SOLUTION:
- ADDITIONAL WATER SPRAY:
- TOTAL FLUID:

3. COAL COVER 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: COAL COVER.

COMPANY NAME - MANUFACTURER: Atlantic Research Co. IN CANADA: NO

DISTRIBUTOR: IN CANADA: NO

AVAILABILITY IN CANADA: - in Western Canada: NO
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Coal.

CHEMICAL INGREDIENTS:

Coal	- 80%
Paraffin Wax Polyethylene Polypropylene	- 20%

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Tests
Tested in U.S.A.

COAL TRAIN TESTS - where- Atlantic Research Corp.
when- 1977-1980
results- stable, durable, waterproof coal coating - manufacturer's claim

FIRE HAZARD - flash point: unknown, but in excess of 250°C

TOXICITY - oral toxicity: ?
- eye irritation: none known or expected
- skin irritation: ?

PHYSICAL PROPERTIES - density: roughly equivalent to coal
- biodegradable: no
- pour point: ?
- viscosity: solid at ambient temperatures.
- odour: none

3. COAL COVER 2 of 3 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None known or expected.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

None known or expected.

COAL CAR PROFILE REQUIREMENTS:

Coal Cover can be used at any reasonable angle of repose. (Manufacturer's claim.)

STORAGE REQUIREMENTS:

Ingredients or mixed solution can be stored dry indefinitely, but must be heated and kept heated prior to use.

APPLICATION REQUIREMENTS:

Custom engineering will be required for each application system. Heating of solution required.

SPRAY SYSTEM - can be used in present sealant spray systems: no
Additions required. Co-axial heat traced delivery lines and special nozzles are necessary.

FREEZE/THAW PROPERTIES:

Temperature cycling has no effect on application or use of the Coal Cover material. Penetration, crust depth, at -35°C is 1/8" to 1/4".

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

Ten minutes but much less at low ambient temperatures.

3. COAL COVER

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	200	litres
	- DILUTE SOLUTION:		litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	200	litres

4. DAREX 3333

1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: DAREX 3333.

COMPANY NAME - MANUFACTURER: W.R. Grace & Co. IN CANADA: NO
DISTRIBUTOR: W.R. Grace & Co. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada:

two weeks or less.

MAIN INGREDIENT: Latex.

CHEMICAL INGREDIENTS: Styrene butadiene latex plus compounding ingredients.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: No ON COAL STORAGE PILES: Yes
ON COAL TRAINS: Yes

Used On Coal Trains: - Bethlehem Steel, PA
- Colorado Westmoreland, CO

COAL TRAIN TESTS -

where- Sparwood, B.C.
when- 1977
results- performed equal to or better than standard latex for one test.

FIRE HAZARD - flash point: Above 140°F

TOXICITY - oral toxicity: ingestion likely to be harmful
- eye irritation: may cause irritation
- skin irritation: may cause irritation
- other: not US federal hazardous waste

PHYSICAL PROPERTIES
- density: Specific Gravity is 1
- biodegradable: No
- pour point: ?
- viscosity: 750 cps
- dispersible in water: an emulsion
- p.H.: 7.5
- total solids: 50%
- odour: Faint styrene

4. DAREX 3333 2 of 3 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None noted in tests and use.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

No adverse effects noted in use. Product is hydrocarbon base.

COAL CAR PROFILE REQUIREMENTS: Best on flat surfaces.

STORAGE REQUIREMENTS:

Freeze/thaw stable but should be stored above 40°F (5°C).

APPLICATION REQUIREMENTS:

Usually applied diluted with water. Agitation needed to get uniform dilution. No special spray equipment requirements.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES-

- freeze/thaw stable but must be fluid to perform
- complete freeze/thaw recovery
- penetration, crust depth, at -35°C not known, but 1/2-1 inches at 5°C or above.

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

Crust is formed and stable as soon as water evaporates or is absorbed. Usually takes only a few minutes.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	7.6	litres
	- DILUTE SOLUTION:	80 to 320	litres
	- ADDITIONAL WATER SPRAY:	80 to 320	litres
	- TOTAL FLUID:	160 to 640	litres

4. DAREX 3333 3 of 3 pages

Application rate varies with type of coal, application equipment, and weather conditions. Optimum application for severe conditions is 2 US gallons of DAREX 3333 diluted with 20 to 40 gallons of water followed by 20-40 gallons of water.

Addition rates as low as 10% of the above with no additional water spray have been satisfactory for less severe conditions (Manufacturer's claim).

5. EX 11-7 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: EX 11-7.

COMPANY NAME - MANUFACTURER: Diachem Industries IN CANADA: YES
DISTRIBUTOR: Diachem Industries IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Pulp Spent Sulphite Liquor.

CHEMICAL INGREDIENTS:

- Pulp Spent Sulphite Liquor Concentrate
- Surface Active Agents.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : UNDER DEVELOPMENT

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: ?
ON COAL TRAINS: Tests only

COAL TRAIN TESTS - where- Sparwood, B.C.
when- 6 July, 1982. Rated as good as latex for one test.
June, 1983 - Average percent coverage remaining was approximately 4% greater than an asphalt based spray for five tests.

FIRE HAZARD - flammability: ?

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?
- other: Toxicity tests are required.

PHYSICAL PROPERTIES - density:
- biodegradable: ?
- pour point:
- viscosity:

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

5. EX 11-7 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

- On some test cars the crust on the front slopes remained intact

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: yes

- During the June, 1983 tests no operational problems were experienced when EX 11-7 (with or without fixing agent) was sprayed.

FREEZE/THAW PROPERTIES:

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

Crusts 4" to 6" deep have been achieved. Cure time not listed.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	18	litres
	- DILUTE SOLUTION:	180	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	180	litres

6. BOND-ALL NJ 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: BOND-ALL NJ.

COMPANY NAME - MANUFACTURER: Norjohn Contracting IN CANADA: YES
DISTRIBUTOR: Norjohn Contracting IN CANADA: YES
Henley Chemicals Ltd. -Western Canada

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Emulsion of Petroleum Resins in water.

CHEMICAL INGREDIENTS:

Naturally occurring polycyclic aromatic hydrocarbons.

Petroleum Resins - thermo plastic resinous petroleum fraction - 60 to 65%.
Proprietary emulsifier and sequestering chemicals - aqueous wetting agents - 35 to 40%.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: ?
ON COAL TRAINS: Tests only

Tested on Coal Trains. Product is under development for use on coal trains.

COAL TRAIN TESTS - where- Sparwood, B.C.
when- October, 1982
results- performed better than latex during a limited number of tests, Ref. 3.

FIRE HAZARD - flammability: non-flammable flash point: 240°C
(CO and CO_2 produced on combustion of the petroleum fraction)

TOXICITY - oral toxicity: LD_{50} greater than 16 grams per kilo of body weight
96 hour LC_{50} - 32 ppm, the 99.8% confidence interval was 10 to 100 ppm
- eye irritation: tested, moderately irritating to eyes
- skin irritation: tested, moderately irritating to skin

6. BOND-ALL NJ

- inhalation toxicity: Observe current ACGIH of 5 mg/m^3 TLV for oil fog mists.
- other: No acute toxicity indicated, however, approved respirators required in poorly ventilated areas.
  - no BOD increase noted in tests
  - petroleum fraction contains naturally occurring polycyclic aromatic hydrocarbons.
- TLV: - 5 mg/m^3

PHYSICAL PROPERTIES
- density: resinous fraction = 1 at 15-6°C
- biodegradable: ?
- residue: 60-65%
- viscosity: @ 25°C, SPS is 10-40 (Emulsion)
- colour: light yellow
- aqueous emulsion - dilutable with water
- hydrocarbon fraction is predominately unsaturated with a maximum of twenty percent saturates

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

- oil impervious gloves should be used. Chemical safety goggles are desirable
- avoid heat and formation of oil mist
- does not present a vapour hazard at 20°C.

APPLICATION REQUIREMENTS:

- sequestering agents make the emulsion stable against hard water permitting dilution of the emulsion with almost any type of water.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

6. BOND-ALL NJ

FREEZE/THAW PROPERTIES:

- must add special agents in order to render the emulsion freeze/thaw stable.

CURE TIME - (for the spray solution to provide a seal on the surface of the coal):

- does not form a filmy or crusted surface
- the emulsion when applied reacts electrochemically with the surface to which it is applied which causes the emulsion to break and the petroleum fraction coalesces to a continuous film which is irreversibly bonded to the surface. The hydrocarbon residue is insoluble in water.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	12 to 24	litres
	- DILUTE SOLUTION:	90 to 125	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	90 - 125	litres

7. CALCIUM CHLORIDE 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: CALCIUM CHLORIDE.

COMPANY NAME - MANUFACTURER: Allied Chemical Canada Inc. IN CANADA: YES*
DISTRIBUTOR: Allied Chemical Canada Inc. IN CANADA: YES

* Note: There is more than one manufacturer of calcium chloride in Canada.

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Calcium Chloride.

CHEMICAL INGREDIENTS: Calcium Chloride.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: ?
ON COAL TRAINS: Yes OTHER: As thawing agent on coal cars.

Used as a thaw agent in USA on coal trains.
Reportedly in use in Europe as dust control agent on coal trains.

COAL TRAIN TESTS - where- USA
when- ?
results- ?

FIRE HAZARD - flammability: None flash point: Above 400°F

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?
- other: known corrosive agent - corrosion starts at a level of 200 ppm.

PHYSICAL PROPERTIES - density: ?
- biodegradable: no
- pour point: ?
- viscosity: ?
- calcium chloride attracts moisture and its solution resists evaporation.
- odour: none

7. CALCIUM CHLORIDE 2 of 3 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

- may cause corrosion in rail cars
- may cause fire side surfaces to corrode in utility boilers
- reduces to form calcium sulphate causing scaling in absorbers.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Unknown.

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

No storage problems associated with liquid calcium chloride.

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES:

- Selected solution strengths prevent freezing.

CURE TIME - (for the spray solution to provide a seal on the surface of the coal):

- not a crusting agent.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	90	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	90	litres

7. CALCIUM CHLORIDE

An application of 23 litres of calcium chloride sprayed on the walls and bottom of the car during winter would prevent any coal retention during dumping (Manufacturer's claim).

Will combine with SO_2 in utility boilers to form $CaSO_3$ and $CaSO_4$, thus reducing sulphur emissions, but corrosion, scaling and sludge disposal problems may result.

8. IPG-60 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: IPG-60.

COMPANY NAME - MANUFACTURER: Davis Gelatine (Canada) Ltd. IN CANADA: YES
DISTRIBUTOR: Davis Gelatine (Canada) Ltd. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Gelatine.

CHEMICAL INGREDIENTS:

Gelatine, Urea, Stabilizing Salts.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : UNDER DEVELOPMENT

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: proposed
ON LOADED COAL TRAINS: Tests only

Tested in Western Canada on loaded coal cars.

COAL CAR TESTS - where- Sparwood, B.C.
when- Sept., 1980
results- It was judged that further testing was required.

FIRE HAZARD - flammability: none flash point: Not applicable

TOXICITY - oral toxicity: non toxic
- eye irritation: nil
- skin irritation: nil

PHYSICAL PROPERTIES - density: 1.2 sp. gr concentrate
- biodegradable: yes
- pour point: - 29°C
- viscosity: 500 CP @ 70°F.
- odour: none

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None.

8. IPG-60 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

None.

COAL CAR PROFILE REQUIREMENTS:

Best on flat surfaces.

STORAGE REQUIREMENTS:

- six months shelf life.

APPLICATION REQUIREMENTS:

- Mixing is required. Mixed solution has a shelf life.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES - suitable for use at temperatures from -35° to +35°C
freeze/thaw recovery: good
penetration, crust depth, at -35°C is approx. 1/2".

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

10 min.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	9.1	litres
	- DILUTE SOLUTION:	91	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	91	litres

9. M167.2 DOWELL
10. M166 DOWELL

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: M-167.2 and M-166.

COMPANY NAME - MANUFACTURER: Dow Chemical IN CANADA: ?
DISTRIBUTOR: Dowell of Canada IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada:

4 week lead time preferred. Distribution system in place.

MAIN INGREDIENT: Latex.

CHEMICAL INGREDIENTS:

- polymer in water emulsion.

M-167.2 is Latex, Surfactant and Biocide
M-166 is Latex only.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: yes ON COAL STORAGE PILES: yes
ON LOADED COAL TRAINS: yes OTHER: used as a soil spray.

In use at several coal mines in Western Canada to spray coal trains.

COAL CAR TESTS - where- Well documented by manufacturer.
when- Tests. 1970's
results- Effective on flat surfaces (Ref. 1)
Additional case histories available from manufacturer.

FIRE HAZARD - flammability: non-flammable flash point: over 200°F

TOXICITY - oral toxicity: none for incidental ingestion of small quantities.
- eye irritation: flush with water for 15 minutes, get medical help.
- skin irritation: wash exposed areas with water.
- other: don't spray in confined spaces unless using a vapour trapping respirator.

9. M167.2 DOWELL
10. M166 DOWELL

PHYSICAL PROPERTIES		M-167.2	M-166
	- density:	8.54	8.41
	- biodegradable:	compatible with Environment (?) (Manufacturer's claim)	
	- pour point:	25°F	32°F
	- viscosity:	165 cps @ 80°F	150 @ 80°F
	- colour:	milky white	milky white

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Has no adverse affects on coal.

COAL CAR PROFILE REQUIREMENTS:

Best on flat surfaces.

STORAGE REQUIREMENTS:

Both products are stable and don't degrade under normal atmospheric conditions.

APPLICATION REQUIREMENTS:

Normal mixture contains 4-6% concentrate in water.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES
- suitable for use at temperatures from -35° to +35°C
- crust resistant to freezing/thawing
- penetration, crust depth, at -35°C is approx. 1"-2".

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

The surfactant in the M-167.2 allows for rapid penetration and makes efficient spraying of loaded cars possible even where less than one minute is allowed for application.

9. M167.2 DOWELL
10. M166 DOWELL

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	3-5	litres/car
	- DILUTE SOLUTION:	95-151	litres/car
	- ADDITIONAL WATER SPRAY:	- Depends on type of coal (If coal is hard-to-wet an additional water spray is usually necessary)	
	- TOTAL FLUID:	95-151	litres

11. VULTEX 2-V-5522-B 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: VULTEX 2-V-5522-B.

COMPANY NAME - MANUFACTURER: General Latex & Chemicals Ltd. IN CANADA: YES
DISTRIBUTOR: General Latex & Chemicals Ltd. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada:

Rapid delivery - Distribution system in place.

MAIN INGREDIENT: Latex - Butadiene Styrene copolymer.

CHEMICAL INGREDIENTS:

Company manufactures various latex products of different chemical composition with different properties - This commodity is a modified latex containing a butadiene/styrene copolymer.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: ?
ON LOADED COAL TRAINS: Yes

Several major coal mines in Western Canada use or have used this product on their coal cars.

COAL CAR TESTS - where- At B.C. and Alberta coal mines
when- On several occasions since 1975
results- Used at several coal mines
Additional case histories available from the manufacturer.

FIRE HAZARD - flammability: non-flammable flash point: N/A

TOXICITY - oral toxicity: 96 hour LC_{50} tested to be 96 ppm (95% confidence limits 84 and 109 ppm)
- eye irritation: contact may cause irritation - eye protection required
- skin irritation: contact may cause irritation - gloves recommended
- other: respirator protection not required
- TLV-NA.

11. VULTEX 2-V-5522-B 2 of 3 pages

PHYSICAL PROPERTIES	- density:	S.G. 1.0 (10 lb/IMP Gallon)
	- biodegradable:	No - approved landfill.
	- thin white liquid:	miscible in water
	- viscosity:	90 CPS (Brookfield RVF No. 2/20 RPM 24°C)
	- p.H.:	8.5 to 9.0, total solids: 48% ± 1%
	- miscible in water:	yes
	- film:	tacky
	- % volatile by vol:	53
	- odour:	none

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

None.

COAL CAR PROFILE REQUIREMENTS-

Best on flat surfaces.

STORAGE REQUIREMENTS:

Stable.

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: yes

- spray systems and mixing facilities in place at most large coal mines that ship coal over long distances.

FREEZE/THAW PROPERTIES:

- at -30°C overnight the product is mushy but not solid
- for over 20 cycles complete freeze/thaw recovery was achieved.

CURE TIME:

See report of tests, Reference 11.

11. VULTEX 2-V-5522-B 3 of 3 pages

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	9.1	litres (2 Imp Gal)
	- DILUTE SOLUTION:	180	litres
	- ADDITIONAL WATER SPRAY:	?	varies from mine to mine
	- TOTAL FLUID:	180	litres (approximately)

Cost of application can vary depending upon the quantity used per car. There is no optimum quantity according to the manufacturer.

12. ICA-16 TRET-O-LITE 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: TRET-O-LITE ICA-16.

COMPANY NAME - MANUFACTURER: Petrolite IN CANADA: YES
DISTRIBUTOR: Corp. of Canada IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada:

Stock in Estevan, Sask. and Calgary, Alta.

MAIN INGREDIENT: Acrylic Copolymer.

CHEMICAL INGREDIENTS:

A solution of an acrylic copolymer and an alkyl sodium succinate in water and ethyl alcohol.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Proposed

Under development as a coal car dust suppressant.

COAL CAR TESTS - where- none reported

FIRE HAZARD - flammability: N/A flash point: above 200°F

TOXICITY - oral toxicity: ?
- eye irritation: may cause skin and eye irritation
- skin irritation: ?
- respiratory: when exposure exceeds the TLV, the use of a chemical respirator with an organic cartridge is recommended.

PHYSICAL PROPERTIES - density: 1.02
- biodegradable: yes
- pour point: F.P. = -4°C
- viscosity: 40 SUS at 16°C.
- odour: none

12. ICA-16 TRET-O-LITE 2 of 2 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None when diluted.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

None.

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

Keep above freezing (2°C neat)
Nozzle requirements vary with rate.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES -

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

Very short.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	9 to 18.5	litres
	- DILUTE SOLUTION:	90 to 185	litres of 10% solution
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	90 to 185	litres
	- RATE:	2 to 4	litres of 10% solution sprayed per square metre.

13. COAL PILE RETAINER 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: COAL PILE RETAINER.

COMPANY NAME - MANUFACTURER: IN CANADA: ?
DISTRIBUTOR: West Chemical Products of Canada IN CANADA: YES

AVAILABILITY IN CANADA - in Western Canada: YES
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Resins - water based.

CHEMICAL INGREDIENTS: Resins - 42.41%
Preservative - 1.5%
Inert ingredients - 56.09%

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Proposed

Under development for use on trains.
Used as a de-icing agent and on coal piles in the USA.

COAL CAR TESTS - where- ?

FIRE HAZARD - flammability: non-flammable flash point: none

TOXICITY - oral toxicity: may be harmful if swallowed
- eye irritation: yes - flush with water
- skin irritation: may irritate if left to dry on skin
- other: no inhalation danger under normal conditions.

PHYSICAL PROPERTIES
- density: S.G. at 15.56°C = 1.03
- biodegradable: ?
- pour point: ?
- viscosity: ?
- p.H.: 8.5 to 8.9
- solubility in water: an emulsion.
- odour: mild odour
- color: white
- boiling point: 100°C

13. COAL PILE RETAINER 2 of 2 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

Stable - avoid freezing since it may damage container. Adequate ventilation required.

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES:

Freezing does not affect the emulsion.

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

14. NALCO 8820 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: NALCO 8820.

COMPANY NAME - MANUFACTURER: Alchem Inc. IN CANADA: ?
DISTRIBUTOR: Alchem Inc. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Latex.

CHEMICAL INGREDIENTS:

Contains surface active agents.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Proposed

Used on bulk storage piles.

COAL CAR TESTS - where- ?

FIRE HAZARD - flash point: greater than 200°F

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: avoid prolonged contact

PHYSICAL PROPERTIES		
	- density:	8.77 lb/gal, 0.9 kg/litre
	- biodegradable:	?
	- pour point:	29°F
	- viscosity:	(Neat at 75°F) 15 cp
	- colour:	white
	- p.H.:	5.8
	- odour:	sweet

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None.

14. NALCO 8820 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

None.

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES:

Freeze/thaw recovery is complete.

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

12 hours to allow complete drying and crust formation.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

Should dilute to a 10% solution with water prior to application.

15. AMS 2000 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: AMS 2000.

COMPANY NAME - MANUFACTURER: Arco Chemical Company IN CANADA: ?
DISTRIBUTOR: IN CANADA: ?

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Organic polymer.

CHEMICAL INGREDIENTS:

Acrylic polymer

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Yes

In use on coal trains in the USA.

COAL CAR TESTS - where- tested and used in the USA.
when- ?
results- ?

FIRE HAZARD - flammability: none. However, dried Polymer Films are capable of burning

TOXICITY - oral toxicity: slight health hazard
- eye irritation: yes
- skin irritation: prolonged skin contact with emulsion may cause irritation
- other: non-hazardous, non-corrosive
- inhalation: can produce headache and nausea.

PHYSICAL PROPERTIES - density: S.G. = 1.1
- biodegradable: ?
- pour point: ?
- viscosity: 1500 cps maximum
- p.H.: 8.0 to 9.5
- colour: white
- odour: mild acrylic odour

15. AMS 2000 2 of 2 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

Store at room temperature.

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:

freeze point approximately (32°F) 0°C
freeze/thaw recovery: ?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

2.2 litres (1/2 gallon) of dilute solution/0.836 sq. m. (1 sq. yd). on storage piles.

16. PENTRON DC-8 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: PENTRON DC-8.

COMPANY NAME - MANUFACTURER: Apollo Technologies IN CANADA: ?
DISTRIBUTOR: Apollo Canada
Dust Suppression Services Inc. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Acrylic Polymers.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Yes

Used in the U.S.A.

COAL CAR TESTS - where- in USA.
when- ?
results- ?

FIRE HAZARD - flammability: none flash point: N/A

TOXICITY - oral toxicity: non toxic
- eye irritation: prolonged contact may cause irritation
- skin irritation: prolonged contact may cause irritation
- other: non-corrosive.

PHYSICAL PROPERTIES
- S.G.: 1.035 at 60°F
- density: 0.86 kg/litre (8.65 lbs/gal)
- biodegradable: yes
- soluble in water: ?
- viscosity: ?
- p.H.: 8 to 9
- colour: amber
- Applied as a foam

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

16. PENTRON DC-8 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Does not lower BTU value of coal.

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

A heated equipment shed is required.

APPLICATION REQUIREMENTS:

- applied as a foam.

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

- 0.023 litres of DC-8+ 1.705 litres of water per tonne of coal - for pile sprays
- applied as a foam.

17. GAMRESIN WP24 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: GAMRESIN WP24.

COMPANY NAME - MANUFACTURER: Gamlen Chemical IN CANADA: ?
DISTRIBUTOR: IN CANADA: ?

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Water soluble resin.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: No

Used on coal piles in the USA.

COAL CAR TESTS - where- ?

FIRE HAZARD -

TOXICITY - oral toxicity: ?
- eye irritation: can cause eye irritation
- skin irritation: ?

PHYSICAL PROPERTIES		
	- S.G.:	1.02
	- density:	8.5 lbs/0.5 gallon
	- biodegradable:	?
	- pour point:	?
	- viscosity:	viscous
	- colour:	opaque, straw coloured liquid
	- p.H.:	8 (3% solution)
	- odour:	mild

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

17. GAMRESIN WP24 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Does not alter the combustion or handling characteristics of coal.

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

Approximately 30 minutes to dry.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

18. COLAS CRUSTING AGENT 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: COLAS CRUSTING AGENT.

COMPANY NAME - MANUFACTURER: Flintkote IN CANADA: ?
DISTRIBUTOR: IN CANADA: ?

AVAILABILITY IN CANADA - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Asphalt.

CHEMICAL INGREDIENTS: ?

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: ?

COAL CAR TESTS - where- ?

FIRE HAZARD - flash point: above 200°F

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?
- other: non-polluting overspray (Manufacturer's claim)

PHYSICAL PROPERTIES - density: 0.821 kg per litre
- biodegradable: ?
- pour point: ?
- viscosity: 20 to 100 saybolt furol seconds at 77°F
- colour: dark brown liquid.

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

18. COLAS CRUSTING AGENT 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Burning characteristics of the residue are compatible with most fuel.

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:

Minimum temperature 35°F.

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

19. MICROFOAM 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: MICROFOAM.

COMPANY NAME - MANUFACTURER: Deter Company IN CANADA: ?
DISTRIBUTOR: Emaco Canada IN CANADA: YES

AVAILABILITY IN CANADA - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Surfactant.

CHEMICAL INGREDIENTS: ?

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: ? OTHER: At transfer points

Not a sealer, product would be added to coal. Used at coal preparation plants in Canada.

COAL CAR TESTS - where- ?

FIRE HAZARD - ?

TOXICITY - oral toxicity: non-toxic
- eye irritation: ?
- skin irritation: prolonged contact can cause irritation
- other: leaves no water-disposal problem.

PHYSICAL PROPERTIES - density: ?
- biodegradable: yes
- pour point: ?
- viscosity: . ?

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

19. MICROFOAM 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

- applied as a foam.

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:

Can be used at below freezing temperatures.

CURE TIME - (for the spray solution to provide a seal on the surface of the coal):

Not a crusting agent. Curing time not listed.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

Applied as a foam.

20. COMPOUND SP 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: COMPOUND SP.

COMPANY NAME - MANUFACTURER: Johnson March IN CANADA: ?
DISTRIBUTOR: IN CANADA: ?

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Latex.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: No

Used on stock piles, Licking River terminal, USA.

COAL CAR TESTS - where- ?

FIRE HAZARD - ?

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?

PHYSICAL PROPERTIES - density: ?
- biodegradable: ?
- pour point: ?
- viscosity: ?

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

20. COMPOUND SP 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

Applied as a foam.

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

Applied as a foam.

21. STARCH SPRAY 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: STARCH SPRAY.

COMPANY NAME - MANUFACTURER: Industrial Grain Products IN CANADA: YES
DISTRIBUTOR: IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Starch.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : UNDER DEVELOPMENT

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Proposed
ON LOADED COAL TRAINS: Proposed

- suggested for use on coal trains.

COAL CAR TESTS - where- none to date

FIRE HAZARD -

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?

PHYSICAL PROPERTIES - density: ?
- biodegradable: ?
- pour point: ?
- viscosity: ?

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

21. STARCH SPRAY 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES -
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

Product only mentioned by supplier as a potential coal car sealant.

22. M-218 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: M-218.

COMPANY NAME - MANUFACTURER: Dow Chemical IN CANADA: NO
DISTRIBUTOR: Dowell of Canada IN CANADA: YES

AVAILABILITY IN CANADA - in Western Canada: YES
- time to deliver to Western Canada:

4 week lead time preferred.

MAIN INGREDIENT: High molecular weight polymer mixed in oil (water).

CHEMICAL INGREDIENTS:

Emulsion consisting of anionic polymer in oil/water.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Yes OTHER: Transfer points.

In use in the USA only.

COAL CAR TESTS - where- Nebraska Public Power District, Sutherland, Nebraska
when- 1981-1982
results- Excellent results. Distributor reports controlled the dust in the crusher. They had previously tried oil, foam, and water spray with poor results (Manufacturer's claim).

FIRE HAZARD - flammability: low flash point: over 210°F

TOXICITY - oral toxicity: low
- eye irritation: low
- skin irritation: low
- other: should not cause a health or environmental problem as M-218 is an emulsion of organic materials in water (Manufacturer's claim).

PHYSICAL PROPERTIES - density: 8.8 lbs/gal.
- biodegradable: ?
- pour point: 12°F

22. M-218 2 of 3 pages

- viscosity: 2,500 cp @ 77°F
4,200 cp @ 40°F
6,800 cp @ 20°F

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

The organic portion is totally combustible and should not affect the quality of such materials as coal, ores, etc.

COAL CAR PROFILE REQUIREMENTS: Unknown.

Product is sprayed directly onto the coal preferable at a point of free fall to assure intimate contact with all of the fine particles.

STORAGE REQUIREMENTS:

Mixed solutions tend to settle after prolonged storage (concentrate settles much more quickly than dilute solutions)

APPLICATION REQUIREMENTS:

Must circulate mixed solutions before use. No danger of degrading the polymer - emulsion by shearing. Select nozzle that will provide 6.25 GPM at 40 psi or 8.33 GPM @ 90 psi.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

However it is recommended that for spraying railcars the compound should be added to the coal as it is being loaded. There would be a capital cost for installing a spray bar at this location. (Spray bars should be at transfer points.)

FREEZE/THAW PROPERTIES:

- may be difficult to apply M-218 water solutions under freezing conditions

CURE TIME - (for the spray solution to provide a seal on the surface of the coal):

- Agglomerates the dust particles immediately. Not a crust forming chemical, M-218 is mixed throughout material.

22. M-218 3 of 3 pages

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	5.0	litres/100 tonne car
	- DILUTE SOLUTION:	12.6	litres/tonne
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	1253	litres/100 metric tonne

23. AMS 2010 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: AMS 2010.

COMPANY NAME - MANUFACTURER: Arco Chemical Company IN CANADA: ?
DISTRIBUTOR: IN CANADA: ?

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Asphalt Emulsion.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Yes OTHER: Transfer points

In use in the USA.

COAL CAR TESTS - where- ?

FIRE HAZARD - flammability: none flash point: 212°F

Dry films are moderately combustible.

TOXICITY - oral toxicity: ?
- eye irritation: severe eye irritation on direct contact - goggles must be worn during application.
- skin irritation: yes on prolonged contact.
- other: non-corrosive.
inhalation will cause headache and nausea - use only in well ventilated area.

PHYSICAL PROPERTIES
- density: ?
- biodegradable: ?
- colour: black
- viscosity: 100-500 cps at 77°F
- water insoluble Yes
- p.H.: 2 to 4.

23. AMS 2010 2 of 2 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

- completely combustible with no adverse by-products
- incomplete combustion may produce CO, CO_2, SO_x.

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

Store at normal room temperature. Extremes in temperature are to be avoided.

APPLICATION REQUIREMENTS:

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

24. HERCOBIND DS-3 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: HERCOBIND DS-3.

COMPANY NAME - MANUFACTURER: Hercules Inc. IN CANADA: ?
DISTRIBUTOR: Harrisons & Crossfield (Canada) Ltd. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Emulsified Resin.

CHEMICAL INGREDIENTS:

- Does not contain a wetting agent but it can be added.

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: Yes
ON LOADED COAL TRAINS: Yes OTHER: mineral tailings, fly ash landfills.

- recommended for use on fine particle minerals shipped in open rail cars.
- tested in USA as a coal car binder.

COAL CAR TESTS - where- in USA (laboratory)
when- ?
results- Cost effective as a fine coal car binder. Crust not affected by rainfall. (Manufacturer's claim).

FIRE HAZARD - flash point: N/A.

TOXICITY - oral toxicity: ?
- eye irritation: avoid eye contact
- skin irritation: avoid repealed skin contact
- other: not considered a nazardous material (Manufacturer's claim).

PHYSICAL PROPERTIES
- density: 1.01 gm/ml (8.4 lb/gal)
- biodegradable: ?
- miscibility with water: complete
- viscosity: 50 - 100 cps (Brookfield)
- p.H.: 8.6
- colour: Brown liquid
- 45% nonvolatiles

24. HERCOBIND DS-3 2 of 2 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

- the resin will burn without residue or alkali production.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

- will add BTU value to coal

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

At 45% non-volatiles, Hercobind DS-3 is stable and easily diluted.

APPLICATION REQUIREMENTS:

- completely miscible in water
- for proper cleaning, application equipment should be flushed with water until clear immediately after use.

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

Crust 1 to 1 1/2 inches in depth achieved during tests (Manufacturer's claim).

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	16	litres
	- DILUTE SOLUTION:	145	litres in an approximate 1:9 (DS-3 to water) for test
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	145	litres

- Applications have been made with 3:1 and 20:1 water/DS-3.

25. BINDTEX

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: BINDTEX.

COMPANY NAME - MANUFACTURER: Chemical Discoveries (UK) Ltd. IN CANADA: NO

DISTRIBUTOR: Rogers Bros Ltd. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: ?
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Polymer.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: ?
COAL TRAINS: Proposed OTHER USES: soil erosion; sand; coal mine floors

USED in Australia and Africa as soil binder. Proposed for coal train use.

COAL CAR TESTS - where- ?
when- ?
results- tested on storage piles versus polyvinyl acetate produced a thicker longer lasting crust (Manufacturer's claim).

FIRE HAZARD - ?

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?

PHYSICAL PROPERTIES - density: S.G. 1.05
- biodegradable: ?
- p.H.: 3 to 4
- viscosity: at 25°C is 75 to 100 poise
- aqueous solution - crust formed is water insoluble
- 10 + 1% SOLIDS
- colour: white to pale yellow liquid

25. BINDTEX 2 of 3 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

- shelf life is 6 months. Longer at lower temperatures.
- packaged in 200 kg drums.

APPLICATION REQUIREMENTS:

- best diluted with water before spraying.

SPRAY SYSTEM - can be used in present sealant spray systems: ?

FREEZE/THAW PROPERTIES:
?

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

25. BINDTEX 3 of 3 pages

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres should dilute 1:9 with water
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

26. DUST BAN 8A08 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: DUST BAN 8A08.

COMPANY NAME - MANUFACTURER: NALCO IN CANADA: ?
DISTRIBUTOR: Alchem Inc. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: short, a distribution system is in place.

MAIN INGREDIENT: Polyacrylamide Emulsion.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: ?
COAL TRAINS: Yes OTHER USES: in U.S.A. as a winterizer, also tailings ponds and mineral piles.

Used on coal cars in western Canada.

COAL CAR TESTS - where- tested Elkford, B.C.
when- ?
results- achieved 88 to 97% crust-remaining for 3 tests (Coal Company claim).

FIRE HAZARD - flash point: none

TOXICITY - oral toxicity: do not take internally
- eye irritation: avoid eye contact
- skin irritation: keep skin contact to a minimum.

PHYSICAL PROPERTIES
- p.H.: 7.8
- density at 25°C: 1.06
- biodegradable: ?
- pour point: - 25°C
- viscosity: 25°C (2% solution by weight) is 10 mPas
- colour: translucent, straw.

26. DUST BAN 8A08 2 of 3 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

?

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

- keep container closed when not in use. Keep away from heat or open flame
- recirculation is recommended while in bulk storage
- Viton or other inert materials should be used for gaskets and pump seals
- bulk storage tanks should be cleaned of any latex based product and totally void of water prior to filling. Product may solidify if added to water.

APPLICATION REQUIREMENTS:

- requires high pressure water, a disperser or a static mixer
- application rate is 2 litres per square meter.
- drums require mixing prior to makeup.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES -

- freeze point: -30°C
- freeze/thaw recovery is complete.

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

26. DUST BAN 8A08 3 of 3 pages

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	2	litres concentration 1.5%
	- DILUTE SOLUTION:	136	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	136	litres

27. VAN KAP 1000 (AMS 2200) 1 of 3 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: VAN KAP 1000 (AMS 2200).

COMPANY NAME - MANUFACTURER: ARCO Chemical IN CANADA: ?
DISTRIBUTOR: Van Waters and Rogers Ltd. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: ?

MAIN INGREDIENT: Petroleum Emulsion.

CHEMICAL INGREDIENTS:

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: Yes ON COAL STORAGE PILES: ?
COAL TRAINS: Tests only

Tested in Western Canada on coal cars.

COAL CAR TESTS - where- at Elkford, B.C.
when- in 1982
results- 86 and 90% crust-remaining for 2 tests (Coal Company claim).

FIRE HAZARD - flammability: non-flammable flash point: > 220°F

TOXICITY - oral toxicity: ?
- eye irritation: ?
- skin irritation: ?

PHYSICAL PROPERTIES - p.H.: 7.0
- S.G.: 0.98
- density: 8.15 lbs/gal
- biodegradable: ?
- pour point: freezes at 32°F
- viscosity: at 77°F is 300 cps
- stable, completely miscible.

27. VAN KAP 1000 (AMS 2200) 2 of 3 pages

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

- non-corrosive to equipment.

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

?

COAL CAR PROFILE REQUIREMENTS:

STORAGE REQUIREMENTS:

- store at normal room temperature
- can be stored for extended periods with no adverse affects.

APPLICATION REQUIREMENTS:

- supplied as a concentrate to be diluted with water 6:1 for normal applications
- can be applied through conventional water spray system
- distribute diluted material uniformly over entire surface.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES:

- freezes at 32°F
- freezing or boiling temperatures are to be avoided.

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):
?

27. VAN KAP 1000 (AMS 2200) 3 of 3 pages

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR	- CONCENTRATE:	7	litres, 4 to 5% during test
	- DILUTE SOLUTION:	160	litres
	- ADDITIONAL WATER SPRAY:	0	litres
	- TOTAL FLUID:	160	litres (approximately)

- for roads the application rate is 1 gallon per sq. yd.

28. MWR 078 and 082 — 1 of 2 pages

SEALANT CHEMICAL - DATA SHEET

BRAND NAME: MWR 078 and 082

COMPANY NAME - MANUFACTURER: Mine Waste Reclamation Ltd. IN CANADA: YES

DISTRIBUTOR: Mine Waste Reclamation Ltd. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: ?

MAIN INGREDIENT: ?

CHEMICAL INGREDIENTS: proprietary

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : UNDER DEVELOPMENT

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Proposed
ON LOADED COAL TRAINS: Proposed OTHER: Proposed for Tailings, Concentrate Storage Piles, Slag Heaps

- product under development
- suggested for use on coal trains.

COAL CAR TESTS - where- Tests planned

FIRE HAZARD - Flash point: 078 at 205°C; 082 at 190°C

TOXICITY - oral toxicity: 078 is minor; 082 should not be ingested
- eye irritation: 078 and 082 - flush with water
- skin irritation: 078 and 082 - irritant with overexposure.

PHYSICAL PROPERTIES - density: - 078 and 082 = 0.926 to 0.930 at 25°C.
- biodegradable: - yes
- pour point: - ?
- viscosity: - ?

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

None

28. MWR- 078 AND 082 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

Will not degrade coal heating properties.

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

- No special requirements - unheated warehouse
- Shelf life at least 6 months.

APPLICATION REQUIREMENTS:

- Dilute with water
- Mechanical agitation is preferable.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

- Any spray system.

FREEZE/THAW PROPERTIES -

- Products do not freeze at -15°C.

CURE TIME:

- Dust abatement control begins immediately
- Cure time is dependent upon photo-oxidation X temperature interaction.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

PER CAR - CONCENTRATE: 3 litres approximate, range is 2 to 4
- DILUTE SOLUTION: 115 to 175 litres
- ADDITIONAL WATER SPRAY: None
- TOTAL FLUID: 120 to 180 litres approx.

Product under development as a potential coal car sealant.

29. HYNATE S-1 1 of 2 pages

SEALANT SPRAY CHEMICAL - DATA SHEET

BRAND NAME: HYNATE S-1

COMPANY NAME - MANUFACTURER: SANYO CHEMICAL IND. IN CANADA: NO
DISTRIBUTOR: MITSUI CO. IN CANADA: YES

AVAILABILITY IN CANADA: - in Western Canada: YES
- time to deliver to Western Canada: 2 weeks

MAIN INGREDIENT: Ethylene Oxide

CHEMICAL INGREDIENTS: Specialty Blend of Surfactants

STATUS AS A PROVEN DUST SUPPRESSANT CHEMICAL SPRAY - : IN USE

SPRAY IS USED ON ROADS: ? ON COAL STORAGE PILES: Yes - in Japan
ON LOADED COAL TRAINS: Proposed OTHER: - Spray at transfer points
- Ship handling coal dust control

- under development for use on coal trains.

COAL CAR TESTS - where- tests on coal trains planned

FIRE HAZARD - ?

TOXICITY - oral toxicity: ?
- eye irritation: ?
- Heavy Metal: less than 20 ppm
- COD: 53 ppm (per 100 ppm Hynate S-1)
- BOD: less than 36 ppm (per 100 ppm Hynate S-1)
- Fish Toxicity: less than 180 ppm for 100% survival with aplocheilus lapitus
- skin irritation: - Wash skin thoroughly with water

PHYSICAL PROPERTIES -density: S.G. is 1.08 at 20°C by hydrometer
- biodegradable: ?
- pour point: freezing point lower than -20°C
- viscosity: 20 cp at 25°C
- color: colourless liquid
- Solubility: - easily soluble in water
- P.H.: - 6.8 for a 1% aq. solution

ADVERSE PROPERTIES when sprayed on coal (i.e. corrosive action on transport equipment and utility boilers, flammability, etc):

- does not contain nitrogen or sulphur, it emits neither NO_x nor SO_x on burning.

29. HYNATE S-1 2 of 2 pages

REACTIBILITY WITH COAL - (i.e. degradation of coal heating properties or coking properties):

None known.

COAL CAR PROFILE REQUIREMENTS:

Unknown.

STORAGE REQUIREMENTS:

- no special requirements

APPLICATION REQUIREMENTS:

- low viscosity and easily diluted even by cold water. It is also low foaming. These features result in easy handling.

SPRAY SYSTEM - can be used in present sealant spray systems: yes

FREEZE/THAW PROPERTIES:

- freezing point is -20°C

CURE TIME - (for the spray solution to provide a sealant crust on the surface of the coal):

- product is not a crusting agent. It is added to water to help water penetrate through small particles of coal.

QUANTITY: Amount that must be sprayed on or added to each 100 metric tonne coal car to produce a sealant crust that will survive an 1100 km rail journey over rough terrain and provide adequate dust abatement is:

- diluted by water 20 to 200 times for use on storage piles.

PER CAR	- CONCENTRATE:	?	litres
	- DILUTE SOLUTION:	?	litres
	- ADDITIONAL WATER SPRAY:	?	litres
	- TOTAL FLUID:	?	litres

Product under development as a potential coal car sealant.

Hynate S-1 accelerates the penetration of water through the surface of bulk coal, and also improves the moisture retention of coal.